Digitally Guided Bone and Tissue Regeneration

Guided bone and tissue regeneration techniques have revolutionized clinicians’ abilities to treat a wide array of clinically challenging situations, ranging from mild to severe bone and soft-tissue defects. However, complications still often occur in severely compromised, complex cases. Typically, there are two main reasons: failure to diagnose properly, and an inability to execute the plan with precision. In this case, the patient unfortunately was struck by a motor vehicle while crossing a crosswalk and sustained multiple complex maxillofacial injuries. A comprehensive, staged approach utilizing advanced digital technologies (GALILEOS FaceScanner and CEREC®, Sirona Dental, Inc., www.sirona.com) led to a functional and esthetic outcome in a minimally invasive manner with high predictability. The case demonstrates the importance of satisfying the following key elements for long-term stability: placement of a 3-dimensionally sound dental implant based on an ideal restorative plan; greater than 2 mm buccal bone and 2-3 mm keratinized gingival tissue.

Key Takeaway Points
- Digital workflow allows patients to be actively engaged in their treatment planning process, enabling them to grasp realistic expectations of their treatment plan prior to committing to any procedures.
- Having superior diagnostic tools and the ability to execute a plan accordingly with precision is paramount.
- A team approach focusing on sound fundamental principles and scientific evidence guided by advanced digital technologies brings clarity, simplicity, and efficiency, resulting in optimal, predictable outcomes with long-term stability.

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Fig 1. A 28-year-old female pedestrian was struck by a motor vehicle while crossing a crosswalk.

Fig 2. The patient sustained multiple complex maxillofacial injuries: orbital floor fracture; fractures of teeth Nos. 7 and 9; complete avulsion of tooth No. 8; complete labial plate dehiscence; significant loss of gingival architecture; and multiple contusions. GALILEOS CBCT (Sirona Dental, Inc.) was used in the diagnosis.

Fig 3. 2 and 3. Retracted view, 3 months following the accident with temporization. Conservative initial surgical debridement was performed in order to avoid a collapse of both the alveolar ridge and soft tissue. There was no significant osteoclastic activity from the initial trauma at this time. Intentional endodontic therapy was rendered on teeth Nos. 7 and 9.

7. 4 months postoperative.

8 and 9. Esthetic re-evaluation with an ideal fixed temporary provisional. Significant soft tissue defects were noticed. (Fig 8 and Fig 9 courtesy of William Heggerick, DDS, prosthodontist, and Yuki Momma, RDT, Weston, Massachusetts)

10. Alveolar width increase from 1 mm to 8 mm was evident at the crest.

11. Subepithelial connective tissue graft.
14. After obtaining 3-dimensionally sound implant position (3 mm from the free gingival margin and 2 mm palatal from the incisal edge), CBCT guided surgery (as shown) was performed (Classic Guide, Sirona Dental, Inc.).

15. 3-mm healing abutment was placed in order to provide a “framework” for epithelization to occur coronally (semi-submerged technique).

16 and 17. CBCT revealed 3-dimensionally sound implant placement No. 8; for optimum esthetic outcome, only a single implant for No. 8 was placed cantilevering pontic No. 7, avoiding central-lateral esthetic dilemma.

18. Patient’s smile at 1.5-year follow-up.

19. GALILEOS FaceScanner.

20. Full view at 1.5-year follow-up. (Fig 20 courtesy of Dr. Heggerick and Mr. Momma)

12 and 13. Incorporation of an ideal fixed temporary provisional into a digital implant proposal (reverse engineering concept via CEREC, Sirona Dental, Inc.).
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